REMARKS

I. Status of the Claims

Claims 1-19 are pending in the application and stand rejected. New claims 20-28 are presented in the amendments above.

Applicants request entry of the foregoing amendments, reconsideration of the claim rejections and reexamination of the application.

II. New Claims 20-27

Support for claims 20-28 is found in the specification and claims as originally filed.

New claim 20 closely tracks the language recited in claim 10, but is written in a format that is more familiar to the Patent and Trademark Office. New claims 21-24 each depend from claim 20 and define subject matter corresponding to claims 10 and 11.

New claim 25 closely tracks the language of claim 14, but is written in a format that is more familiar to the Patent and Trademark Office. New claims 26-28 each depend from claim 25 and defines subject matter corresponding to claims 17-19. Applicants respectfully request entry of new claims 20-28.

The Fee Transmittal Form filed herewith provides required fees for the additional claims.

III. Abstract

The Abstract of the Disclosure submitted in response to the Office Action mailed on June 19, 2002 is submitted again as Attachment A with this response, on a separate sheet of paper.

IV. Patentability Under § 101

Claims 10, 11, 14, and 17-19 are rejected under § 101. Applicants respectfully traverse the rejection.

It is well established that the threshold requirement for patentability under 35 U.S.C. § 101 is low. The Supreme Court has held that "anything under the sun that is made by man" meets the

requirement of 35 U.S.C. § 101. *Diamond v. Chakrabarty*, 447 U.S. 303, 309, 206 U.S.P.Q. 193, 197 (1980). Claim 10 recites use of the aerogels obtained in claim 7 for producing molded articles or surface coatings with thermal insulation properties, sound absorption properties, adsorption properties, and/or barrier properties against water and/or organic solvent.

Claim 11 recites use of composite materials obtained in claim 6 for producing granulates or molded ceramic articles.

Claim 14 recites use of materials obtained in claim 8 in conjunction with dyes, indicators, receptors, enzymes, and/or biomolecules for medical diagnostics and sensor technology.

Claim 17 recites use of materials obtained in claim 9 in conjunction with dyes, indicators, receptors, enzymes, and/or biomolecules for medical diagnostics and sensor technology.

Claim 18 recites use of a molded article or surface coating obtained in claim 12 in conjunction with dyes, indicators, receptors, enzymes, and/or biomolecules for medical diagnostics and sensor technology.

Claim 19 recites use of a molded article or surface coating obtained in claim 15 in conjunction with dyes, indicators, receptors, enzymes and/or biomolecules for medical diagnostics and sensor technology.

Each of claims 10, 11, 14, and 17-19 clearly meets the threshold requirement stated by the Supreme Court in *Chakrabarty*. Therefore, each of claims 10, 11, 14, and 17-19 meets the utility requirements of 35 U.S.C. § 101. Applicants request withdrawal of the rejection.

V. Claims 1, 3, 7, and 8 are Patentable Over Harmer et al

Claims 1, 3, 7 and 8 are rejected under § 102(b) over Harmer et al (US 5,824,622). The Examiner asserts (pages 4-5 of the Office Action), that the process steps of Harmer et al, and in particular the steps disclosed in example 2, are exactly the same as the steps recited in present claim 1. The Examiner also asserts that the process steps of Harmer et al inherently form interpenetrating organic and inorganic networks. Applicants disagree and respectfully traverse the rejection.

Harmer et al does not disclose, teach or suggest the subject matter of claim 1 or any of its dependent claims. That is, Harmer et al fails to disclose, teach or suggest a process for production of

materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm by (1) mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds; (2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks; and (3) drying the gel.

The process defined by present claim 1 is easily and clearly distinguishable over Example 2 of Harmer et al cited by the Examiner. After "mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof ... with silicon dioxide compounds," present claim 1 calls for "changing the pH of and/or thermally treating the aqueous solution or dispersion ..." In contrast, in Example 2 of Harmer et al, after mixing a perfluorinated ion exchange resin solution (an aqueous Nafion® solution) with a silicon containing solution, "[t]he solution was left to stand.

Nor is there proper support for rejection of the claims on the basis of alleged inherent disclosure in Harmer et al. The Examiner has not provided any objective extrinsic evidence indicating that Harmer et al inherently discloses interpenetrating organic and inorganic networks. Even if it were to be established that a certain result may occur, this would be insufficient to establish inherency. To establish inherency, extrinsic evidence must make clear that the missing element is necessarily present and that it would be so recognized by those skilled in the art. *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). Because the Examiner has not provided any extrinsic that indicates interpenetrating organic and inorganic networks are necessarily present in Harmer et al, and because the Examiner has not provided any extrinsic evidence that one skilled in the art would recognize that interpenetrating organic and inorganic networks are necessarily present in Harmer et al, the rejection is improper and should be withdrawn.

Moreover, the assertion of inherent disclosure is contradicted by the express disclosure of Harmer et al. Harmer et al clearly understood the concept of interpenetrating networks. The Background section mentions "silicon oxide interpenetrating networks." But Harmer et al never refers to its own organic-inorganic microcomposites as having interpenetrating networks. Harmer et al expressly refers to its inorganic component as a "network," but not its organic component. Its

microcomposites are said – in fact, numerous times – to have a network of silica or metal oxide (see, e.g., the Abstract of Harmer et al), and elsewhere Harmer et al refers to "the silica network of the microcomposite" (see, e.g., Col. 3, lines 32-34). But Harmer et al's organic polymers are never referred to or disclosed or described as forming a network. And Harmer et al's organic polymers and metal oxides are never referred to or disclosed or described as forming interpenetrating organic and inorganic networks.

Accordingly, Harmer et al does not anticipate, or render obvious, present claim 1 or any claims that depend directly or indirectly from claim 1. Applicants request withdrawal of the rejection and allowance of the claims.

VI. Claims 5, 9 and 10 are Patentable over Harmer et al. in view of Jansen et al.

Claims 5, 9, and 10 are rejected under § 103 over Harmer et al. in view of Jansen et al. (US 5,795,556). The Examiner asserts that Harmer et al and Jansen are utilized to form gels, and, therefore, that the combination of Harmer et al and Jansen is in itself *prima facie* obvious. Applicants respectfully traverse the rejection.

Claim 5 depends directly from claim 1 and is patentable over the combination of Harmer et al and Jansen for at least the same reasons. As discussed above Harmer et al fails to anticipate, or render obvious, claim 1 and its dependent claims. Jansen fails to cure the deficiencies of Harmer et al. Jansen involves simply silica xerogels. It does not teach or suggest interpenetrating networks.

With reference to claim 9, the combination of Harmer et al and Jansen fails to teach or suggest an aerogel consisting of organic and inorganic networks interpenetrating on a scale of no more than 100 nm with a density of no more than 0.6 g/cm^3. Notably, for example, as discussed above, there is no disclosure in Harmer et al, with or without Jansen, of aerogel consisting of the required interpenetrating networks. As also discussed above, the Examiner also has not identified objective evidence that the combination of Harmer et al and Jansen inherently discloses, teaches of suggests the claim 9 aerogels with interpenetrating networks, and the express disclosure of Harmer et al goes in the other direction.

Likewise, claim 10 recites the use of aerogels according to claim 9, which are obtainable

according to the process of claim 7. (Claim 7 depends from claim 1.) The combination of Harmer et al and Jansen fails teach or suggest use of such aerogels for the production of molded articles or surface coatings with thermal insulation properties, sound absorption properties, adsorption properties, and/or barrier properties against water and/or organic solvents.

Moreover, the Harmer et al and Jansen citations are not properly combined. Even though each of Harmer et al and Jansen may be related to materials involving gels, such a relationship does not automatically render the citations combinable. Instead, the test for suggestion or motivation to combine citations requires evaluation of "the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved." *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).[1] The Examiner has failed to identify any motivation, within either of the two citations themselves, to combine their selected portions and to modify them in order to arrive a the present invention.

Because the combination of Harmer et al and Jansen fails to disclose, teach or suggest all the elements of any of claims 5, 9 or 10, and because Harmer et al and Jansen are not properly combinable, the rejection is improper and should be withdrawn

VII. Claims 4, 6, 11-19 are Patentable over Harmer et al. in view of Jansen et al and Geiss et al.

Claims 4, 6, and 11-19 are rejected under § 103 over Harmer et al. in view of Jansen et al. and Geiss et al. (US 5,948,314). Applicants respectfully traverse the rejection.

Geiss et al fails to cure the above-discussed deficiencies of Harmer et al. Geiss et al does not teach or suggest interpenetrating networks; it uses aerogel particles formed prior to mixing with a polymer binder. Moreover, it is not clear how the pre-formed aerogel particles of Geiss et al could be used in the Harmer et al process. Certainly there is no motivation identified within any of the

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1 Also see *In re Rouffet*, 140 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) holding that even though the combination of the references taught every element of the claimed invention, a rejection based on a *prima facie* case of obviousness was improper because there was no motivation to combine the references.

citations for selectively combining and modifying their various process aspects to arrive at the present invention. Each of claims 4, 6, 11 and 14 depends directly or indirectly from claim 1 or incorporates it by reference and, therefore, is patentable over the combination of Harmer et al, Jansen and Geiss for at least the reasons stated above. Moreover, each is further patentable in view of its additional elements or further definition of elements. Similarly, each of claims 12, 13, and 15-19 depends directly or indirectly from claim 9 or incorporates it by reference and, therefore, is patentable over the combination of Harmer et al, Jansen and Geiss for at least the reasons stated above. Moreover, each is further patentable in view of its additional elements or further definition of elements.

Because the combination of Harmer et al, Jansen and Geiss fails to disclose, teach or suggest any of claims 4, 6, and 11-19, and because the citations are not properly combinable, each of claims 4, 6, and 11-19 is patentable over the citations. The rejection should be withdrawn and the claims allowed.

VIII. Claim 2 is Patentable over Harmer et al in view of Pekala

Claim 2 is rejected under § 103 over Harmer et al. in view of Pekala. Applicants respectfully traverse the rejection.

Pekala fails to cure the above-discussed deficiencies of Harmer et al. Pekala does not teach or suggest interpenetrating networks; it discloses organic aerogels and expressly distinguishes inorganic aerogels. (See, e.g., Col. 1, lines 42-47.) There is no motivation identified within Pekala or Harmer et al for selectively combining and modifying their various process aspects to arrive at the present invention. Accordingly, the combination of Harmer et al and Pekala fails to disclose, teach or suggest all the elements of claim 2.

Because the combination of Harmer et al and Pekala fails to disclose, teach or suggest the subject matter of claim 2, and because Harmer et al and Pekala are not properly combinable, the combination of Harmer et al and Pekala fails to render claim 2 obvious. Applicants request withdrawal of the rejection.

IX. Claim 2 is Patentable over Harmer et al in view of Mager et al

Claim 2 is rejected under § 103 over Harmer et al. in view of Mager et al. (US 6,271,292). Applicants respectfully traverse the rejection.

Mager et al fails to cure the above-discussed deficiencies of Harmer et al. Specifically, Mager et al does not teach or suggest a process for production of materials with interpenetrating organic and inorganic networks on a scale of no more than 100 nm by (1) mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds; (2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks; and (3) drying the gel.

Mager et al does not mention aerogels. Nor does it mention organic networks or polymer networks. Nor does it mention mixing aqueous solutions or dispersion of organic polymers, polymer precursors, or mixtures thereof, which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds. Notably, all of the examples of Magar et al use polyacrylates in organic solvents: Desmophen® A665 or Desmophen® A450. At Col. 7, lines 19-26, Magar et al states, "Desmophen® A 665 (3.0% of OH groups) was used as a 65% solution in n-butyl acetate/xylene (3:1), and Desmophen® A 450 (1.0% of OH groups) was used as a 50% solution in n-butyl acetate." The references to interpenetrating networks.

Nor is any motivation identified by the Examiner within Mager et al or Harmer et al for selectively combining and substantially modifying their various process aspects to arrive at the invention of claim 2. Accordingly, the combination of Harmer et al and Mager et al fails to disclose, teach or suggest all the elements of claim 2.

Because the combination of Harmer et al and Mager et al fails to disclose, teach or suggest the subject matter of claim 2, and because Harmer et al and Mager et al are not properly combinable, the combination of Harmer et al and Mager et al fails to render claim 2 obvious. Applicants request withdrawal of the rejection.

X. Conclusion

Claims 1-19 are patentable over the citations for the reasons stated above. New claims 20-28 are patentable over all citations of record for similar reasons. Applicants request withdrawal of the rejection and allowance of the claims.

Respectfully submitted
Sievers et al.

10 January 2003
Date

Peter D. McDermott (Reg. No. 29,411)
Attorney for Applicants
Banner & Witcoff, LTD
28 State St. - 28th Floor
Boston, MA 02109
617-227-7111

Banner & Witcoff, Ltd.
28 State Street, 28th Floor
Boston, MA 02109
Telephone: (617) 227-7111
Facsimile: (617) 227-4399

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(B & W 003259.00011)

Applicant:	**Sievers et al.**	**Paper No:**	**10**
U.S. Serial No.:	**09/730,463**	**Group Art Unit:**	**1714**
Filed:	**Dec. 05, 2000**	**Examiner:**	**Lee, K.W.**

Title: **NANOPOROUS INTERPENETRATING ORGANIC-INORGANIC NETWORKS**

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VERSION SHOWING CHANGES MADE

Claim 20. A process of producing materials, the process comprising:

(a) providing organic and inorganic networks which interpenetrate on a scale of no more than 100 nm, the organic and inorganic networks which interpenetrate on a scale of no more than 100 nm produced by a method comprising:

(1) mixing aqueous solutions or dispersions of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds,

(2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks, and

(3) drying the gel;

(b) producing materials using the gel, the materials comprising thermal insulation properties, sound absorption properties, adsorption properties, and/or barrier properties against water and/or organic solvent.

Claim 21. The process of claim 20 in which the gel is dried under conditions which lead to a composite material.

Claim 22. The process of claim 21 in which the produced materials are granulates or molded ceramic articles.

Claim 23. The process of claim 20 in which the gel is dried under conditions which lead to a xerogel or an aerogel.

Claim 24. The process of claim 23 in which the produced materials comprise molded articles or surface coatings.

Claim 25. A process of using materials for medical diagnostics and sensor technology, the process comprising:

(a) providing organic and inorganic networks which interpenetrate on a scale of no more than 100 nm, the organic and inorganic networks which interpenetrate on a scale of no more than 100 nm produced by a method comprising:

(1) mixing aqueous solutions or dispersions of organic polymers, polymer precursors, or mixtures thereof which are capable of forming polymer networks in the aqueous phase with silicon dioxide compounds,

(2) changing the pH of and/or thermally treating the aqueous solution or dispersion to form a gel consisting of interpenetrating organic and silica gel networks, and

(3) drying the gel;

(b) producing materials comprising the gel in conjunction with dyes, indicators, receptors, enzymes and/or biomolecules; and

(c) using the materials for medical diagnostics and sensor technology.

Claim 26. The process of claim 25 in which the materials have a density of no more than 0.6 g/cm^3.

Claim 27. The process of claim 25 in which the materials comprise a molded article or surface coating.

Claim 28. The process of claim 27 in which the materials have a density of no more than 0.6 g/cm^3.